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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/580,890

05/25/2006

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EXAMINER

ENIN-OKUT, EDU E

ART UNIT

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/580,890	<b>Applicant(s)</b> YANG KOOK ET AL.	
	<b>Examiner</b> Edu E. Enin-Okut	<b>Art Unit</b> 1727	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 21 November 2011.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 5) ☒ Claim(s) 16 and 18-29 is/are pending in the application.
- 5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 16 and 18-29 is/are rejected.
- 8) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)         | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____.                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date ____.   | 6) <input type="checkbox"/> Other: ____.                          |

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**CATHODE ACTIVE MATERIAL FOR LITHIUM SECONDARY BATTERY,**  
**PROCESS FOR PREPARING THE SAME**  
**AND REACTOR FOR USE IN THE SAME PROCESS**

***Detailed Action***

1. The amendments and remarks filed on November 21, 2011 were received. Applicant has amended claims 16, 20, 27 and 29, and cancelled claim 17. Claims 16 and 18-29 are pending.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

***Claim Rejections - 35 USC § 112***

3. The rejection of claim 20 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, is withdrawn because claim 20 was amended.

***Claim Rejections - 35 USC § 103***

4. The rejection of claims 16, 17, 19, 20, 22, 26, 27, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. (US 2003/0170540) in view of Lambert, Jr. et al. (US 4,594,228) as presented in the previous Office Action is withdrawn because claims 16, 20, 27 and 29 were amended and claim 17 was cancelled.

5. Claims 16, 18, 19, 20, 22, 26, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. (US 2003/0170540) in view of Moriuchi et al. (JP 2003-257416 A; see JPO Abstract and machine translation).

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Regarding claims 16, 18, 19, 26 and 27, Ohzuku teaches a process for preparing a positive electrode active material for a lithium secondary battery of a lithium-containing oxide having a general formula, such as  $\text{Li}[\text{Li}_x(\text{A}_y\text{B}_{1-y})_{1-x}]\text{O}_2$  (where A and B are different transition metal elements (e.g., Fe, Ni, Mn and Co),  $0 \leq x \leq 0.3$ , and  $0 < y < 1$ ) and  $\text{Li}[\text{Li}_x(\text{A}_y\text{B}_y\text{C}_p)_{1-x}]\text{O}_2$  (where A and B are as described above, C is at least one kind of an added element different from A and B (e.g., Al, Mn, Ca, Sr, Yt, Yb, Fe, Ni, Mn and Co),  $0 \leq x \leq 0.3$ , and  $0 < 2y + p < 1$ ), and includes a oxides like a  $\text{LiCo}_{1/2}\text{Ni}_{1/2}\text{O}_2$  and  $\text{LiNi}_{1/3}\text{Mn}_{1/3}\text{Co}_{1/3}\text{O}_2$  (Title; para. 24-26,40,41,55,56,138,211,212; Figs. 10,11; Claims 2,3,17,18). The lithium-containing oxide is obtained by mixing a precursor, a hydroxide or an oxide containing two or more kinds of transition metals, with a lithium compound, such as a lithium carbonate or a lithium hydroxide, and sintering the mixture (para. 35,37). The precursor is obtained, via coprecipitation, from an aqueous solution of metal sulfates (e.g., nickel sulfate, manganese sulfate, and cobalt sulfate), NaOH and  $\text{NH}_3$  in a reaction bath within an apparatus such as that shown in Figs. 1 and 4 (para. 85-88,96-103,138,211,212; Figs. 1,4). The positive electrode active material is composed of a mixture of crystalline particles of the lithium-containing oxide having a particle size of 0.1-2  $\mu\text{m}$  and a secondary particle, of the above crystalline particles, having a particle size of 2-20  $\mu\text{m}$ , more likely 10-20  $\mu\text{m}$  (para. 31,97; Claim 9).

As to the ranges in the formulas for the first and second lithium metal oxide recited in claims, it has been held that obviousness exists where the claimed ranges overlap or lie inside ranges disclosed by the prior art. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). See MPEP 2144.05 (I). Further, it has been held that, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). See MPEP 2144.05 (II).

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Ohzuku does not expressly teach a first lithium metal composite oxide and a second lithium metal composite oxide, produced separately, where the first lithium metal composite oxide has a mean particle diameter that is less than 90% of the mean diameter of the second lithium metal composite oxide, and both oxides both oxides are composed of a primary particle and a secondary particle of the aggregate of the primary particles; or, that the active material includes 5-40 wt% of the first lithium metal oxide.

As to a first lithium metal composite oxide and a second lithium metal composite oxide, where the first lithium metal composite oxide has a mean particle diameter that is less than 90% of the mean diameter of the second lithium metal composite oxide, Moriuchi teaches a positive electrode for a lithium ion secondary battery having an active material that includes a mixture of two lithium composite oxides where one oxide has a mean particle diameter of 7-13  $\mu\text{m}$ , the other oxide has a mean particle diameter of 1-6  $\mu\text{m}$ , and are incorporated into the active material in amounts of 1:0.1-1.5, more preferably 1:0.2-0.6 (i.e., from 9.1–60%, more preferably 16.7–37.5%, of the oxide with a mean particle diameter of 1-6  $\mu\text{m}$ ) by weight (Abstract; machine translation, para. 10-13).

It would have been obvious to one of ordinary skill in the art at the time of the invention to include a mixture of first and second lithium metal composite oxides in the method of Ohzuku, where the mean diameter of the first oxide is less than 90% of the mean diameter of the second lithium metal composite oxide and the amount of the first oxide in the active material is as recited in the claims, because Moriuchi teaches that use of a mixture of two lithium composite oxides with differing diameters in an active material can assist in producing an positive electrode with a higher packing density, thereby reducing the possibility of an internal short circuit of a battery (see Moriuchi, Abstract, machine translation, para. 8-9); and, it has been held that obviousness exists where the claimed ranges overlap or lie inside ranges disclosed by the prior

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art. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). See MPEP 2144.05 (I).

As to producing the first and second lithium metal composite oxides separately where both oxides both oxides are composed of a primary particle and a secondary particle of the aggregate of the primary particles, Ohzuku teaches that the positive electrode active material is composed of a mixture of crystalline particles of the lithium-containing oxide having a particle size of 0.1-2  $\mu\text{m}$  and a secondary particle, of the above crystalline particles, having a particle size of 2-20  $\mu\text{m}$ , more likely 10-20  $\mu\text{m}$ , as discussed above. With respect to forming a first and second lithium composite oxides separately, it would have been obvious to one of ordinary skill in the art at the time of the invention to produce the first and second lithium composite oxides separately in the method of Ohzuku because Ohzuku teaches that the composite lithium metal oxides can be produced using the method described above.

*Regarding claim 20*, as discussed above, Ohzuku teaches a positive electrode active material composed of a lithium-containing oxide described by the formulas described above can include compounds like a  $\text{LiNi}_{1/3}\text{Mn}_{1/3}\text{Co}_{1/3}\text{O}_2$ . As to the oxidation value of nickel, manganese and cobalt, applicant states in paragraph 121 of the instant specification that the cathode active materials described on in Examples 1-11 have nickel, manganese and cobalt oxidation values as recited in the claim. Thus, these oxidation values are found to be an inherent characteristic of the composite cathode material comprising all the claimed elements.

Since the prior art does teaches a composite cathode material comprising substantially the same elements or components as that of the applicant, it is contended that the active material of the prior art has similar oxidation values. Products of identical chemical composition cannot have mutually exclusive properties, and thus, the claimed property (i.e. the specific output energy density), is necessarily present in the prior art material. The courts have held that

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"[p]roducts of identical chemical composition cannot have mutually exclusive properties." A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See MPEP 2112.

*Regarding claim 22*, Ohzuku et al. teaches the aqueous solution containing nickel sulfate, manganese sulfate and cobalt sulfate, which is three metal salts being used as the metal precursor (para. 211-212).

6. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. (US 2003/0170540) and Moriuchi et al. (JP 2003-257416 A) as applied to claims 19, 20, 22, 26, and 27 above, and further in view of Lambert, Jr. et al. (US 4,594,228). Additional supporting evidence provided by the Collins English Dictionary and the Chambers 21st Century Dictionary.

Ohzuku and Moriuchi are applied and incorporated herein for the reasons above.

*Regarding claim 29*, Ohzuku teaches the method for preparing a composite cathode active material as discussed above with respect to claim 1. Two experimental apparatus, as shown in Figs. 1 and 4, are used to produce the precursor described above (para. 46,49,85-88,96-103; Figs. 1,4). Both apparatus have agitating rods with a number of rotary vanes affixed thereto (Figs. 1,4; see annotated figures below). Further, since a baffle is defined as a device (as a plate, wall, or screen) to deflect, check, or regulate flow or passage (as of a fluid, light or sound) (see baffle (noun) on Merriam-Webster Online Dictionary), both apparatus also include a number of baffles (Figs. 1,4; see the annotated figures below).

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*Annotated figures from Ohzuku:*

FIG. 1

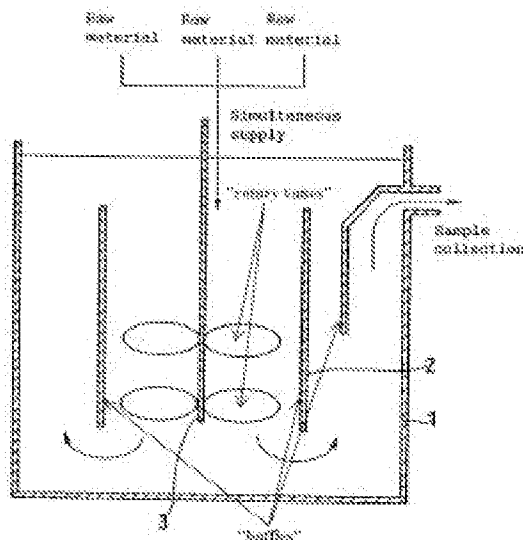
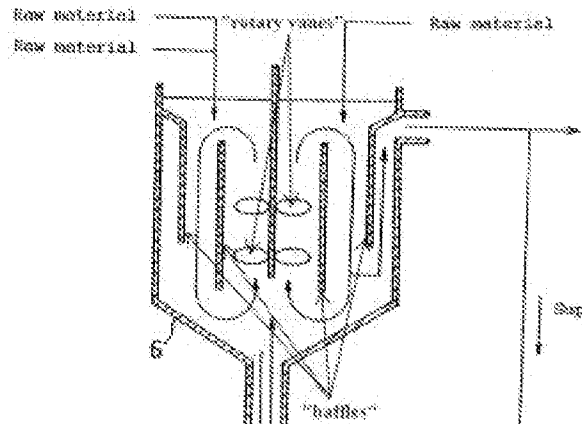


FIG. 4



Ohzuku does not expressly teach the rotary vanes being the reverse vane type; or, that the baffles have a shape of a flat panel and are connected to the inner wall via connecting rods.

However, it has been held that, to be entitled to weight in method claims, the recited structure limitations therein must affect the method in a manipulative sense, and not to amount to the mere claiming of a use of a particular structure. *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976); *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951). Further, a change in shape is generally recognized as being within the level of ordinary skill in the art. *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966)> See MPEP 2144.04 (IV).

Further, Lambert teaches a mixing apparatus with an agitator shaft including an impeller with blades pitched downward, and an impeller with blades pitched upward, mounted thereon (Title; 3:63-4:27). These impellers produce a downward flow and an upward flow, respectively (5:39-41, 5:35-36).



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Thus, it would be obvious to one of ordinary skill in the art at the time of the invention to pitch the vanes used in the reactor employed in the method of modified Ohzuku to form one set of vanes producing flow in one direction, and another set producing flow in an opposite direction, because Lambert teaches use of these type of vanes configured in this manner to disperse liquids that stagnate near both the top and bottom of the reactor (see Lambert, 5:57-60, 5:63-65); and, it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse*, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950). See MPEP 2144.04 (VI).

7. Claims 21 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. (US 2003/0170540) and Moriuchi et al. (JP 2003-257416 A) as applied to claims 16, 19, 20, 22, 26, and 27 above, and further in view of Aladjov (US 5,788,943).

Ohzuku and Moriuchi are applied and incorporated herein for the reason above.

*Regarding claim 21 and 28*, Ohzuku does not expressly teach that the first and second mixtures are exposed to ultrasonic energy.

Aladjov teaches a method for making an electrode material for a battery where controlling the application of ultrasonic energy to a reactor used to form the electrode particles facilitates the production of particles in a wide range of proportions (sizes) (Title; 5:32-51).

It would have been obvious to one of ordinary skill in the art at the time of the invention to expose the first and second mixtures used in the method of modified Ohzuku because Aladjov teaches that the application of ultrasonic energy can assist in controlling the size and crystal structure of the particles formed (see Aladjov, 5:32-51).

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8. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. (US 2003/0170540) and Moriuchi et al. (JP 2003-257416 A) as applied to claims 16, 19, 20, 22, 26, and 27 above, and further in view of Tanigawa et al. (US 2002/0164527).

Ohzuku and Moriuchi are applied and incorporated herein for the reason above.

*Regarding claim 23*, Ohzuku teaches the concentration for the aqueous ammonia solution is 4.8 mol/liter, the concentration of the aqueous nickel sulfate is 1.2 mol/liter, the concentration of the aqueous manganese sulfate is 1.2 mol/liter, and the concentration of the aqueous cobalt sulfate is 1.2 mol/liter (para. 211).

Ohzuku does not expressly teach that the concentration of the aqueous ammonia solution is between 0.2 and 0.3 of the aqueous metal solution.

Tanigawa teaches a process for making a positive electrode active material with precipitation of a nickel hydroxide powder from an aqueous solution containing nickel ion and at least an ion of Co or Mn, and that it is possible to manipulate the composition, particle circularity, particle size, specific surface area and crystallinity of the obtained active material by managing and controlling the concentration, pH, and retention time of the aqueous solution in the reaction vessel (para. 58-61).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary concentration of the aqueous solution in the reaction vessel employed in the method of modified Ohzuku because Tanigawa teaches that by managing and controlling the concentration of the aqueous solution in the reaction vessel it is possible to manipulate the composition, particle circularity, particle size, specific surface area and crystallinity of the obtained active material (see Tanigawa, para. 58-61). Discovery of optimum value of result effective variable in known process is ordinarily within skill of art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

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The remaining limitations recited in this claim have been addressed above with respect to claim 22.

*Regarding claim 24*, Ohzuku teaches 4.8 mol/liter of aqueous NaOH being added to the apparatus (para. 211).

Ohzuku does not expressly teach the aqueous NaOH being added to make a pH of 11.0 to 11.5.

However, Tanigawa also teaches a process for making a positive electrode active material with precipitation of a nickel hydroxide powder from an aqueous solution containing nickel ion and at least an ion of Co or Mn, and that it is possible to manipulate the composition, particle circularity, particle size, specific surface area and crystallinity of the obtained active material by managing and controlling the concentration, pH, and retention time of the aqueous solution in the reaction vessel (para. 58-61).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the pH of the aqueous solution in the reaction vessel employed in the method of modified Ohzuku because Tanigawa teaches that by managing and controlling the pH of the aqueous solution in the reaction vessel it is possible to manipulate the composition, particle circularity, particle size, specific surface area and crystallinity of the obtained active material (see Tanigawa, para. 58-61). Discovery of optimum value of result effective variable in known process is ordinarily within skill of art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

9. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. (US 2003/0170540) and Moriuchi et al. (JP 2003-257416 A) as applied to claims 16, 19, 20, 22, 26, and 27 above, and further in view of Sun et al. (US 6,071,489).

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Ohzuku and Moriuchi are applied and incorporated herein for the reason above.

*Regarding claim 25*, Ohzuku teaches mixing and reacting a nickel manganese cobalt composite hydroxide with lithium hydroxide to obtain a lithium-containing oxide such as  $\text{LiNi}_{1/3}\text{Mn}_{1/3}\text{Co}_{1/3}\text{O}_2$  (para. 211,212).

Ohzuku does not expressly teach a chelating agent being used in the step of obtaining the lithium metal composite oxide.

Sun teaches glycolic acid being used as a chelating agent in the step of preparing the lithium cathode active material, so that a pure phase of lithium cathode active material powder is prepared (12:29-35).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize glycolic acid as a chelating agent in the step of forming the lithium positive electrode active material, which is the lithium metal composite oxide, employed in the method of modified Ohzuku because Sun teaches glycolic acid being used as a chelating agent in the step of preparing the lithium cathode active material, so that a pure phase of lithium cathode active material powder is prepared (see Sun, 12:29-35).

### ***Response to Arguments***

10. With respect to the Ohzuku reference, applicant argues that Ohzuku does not teach a compound that reads upon the  $\text{LiNi}_{1-x-y}\text{Co}_x\text{M}'_y\text{O}_2\text{P}_z$  oxide as recited in claim 27 on p. 11-12 of its remarks filed on November 21, 2011.

However, because Ohzuku teaches that its process produces a lithium-containing oxide having general formulas such as  $\text{Li}[\text{Li}_x(\text{A}_y\text{B}_{1-y})_{1-x}]\text{O}_2$  (where A and B are different transition metal elements (e.g., Fe, Ni, Mn and Co),  $0 \leq x \leq 0.3$ , and  $0 < y < 1$ ) and  $\text{Li}[\text{Li}_x(\text{A}_y\text{B}_y\text{C}_p)_{1-x}]\text{O}_2$  (where A and B are as described above, C is at least one kind of an added element different from A and B

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(e.g., Al, Mn, Ca, Sr, Yt, Yb, Fe, Ni, Mn and Co),  $0 \leq x \leq 0.3$ , and  $0 < 2y + p < 1$ ) as described in the rejections above, the reference reads upon the  $\text{LiNi}_{1-x-y}\text{Co}_x\text{M}'_y\text{O}_2\text{P}_z$  recited in the claim. For example, the lithium-containing oxide of Ohzuku represented by the formula  $\text{Li}[\text{Li}_x(\text{A}_y\text{B}_{1-y})_{1-x}]\text{O}_2$  discussed above can include a compound such as a  $\text{Li}(\text{Ni}_y\text{Co}_{1-y})\text{O}_2$  where  $0 < y < 1$ .

11. As to the remainder to applicant's arguments, they have been considered but applicant has amended the claims such that new grounds of rejection were necessitated.

### ***Conclusion***

12. The following prior art made of record and not relied upon in the previous Office Action, Hosoya et al. (WO 03/063275 A1), remains pertinent to applicant's disclosure.

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Edu E. Enin-Okut** whose telephone number is **571-270-3075**. The examiner can normally be reached on Monday through Thursday, 7 am to 3 pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Barbara Gilliam, can be reached on 571-272-1330. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Edu E. Enin-Okut/  
Examiner, Art Unit 1727

/Barbara L. Gilliam/  
Supervisory Patent Examiner, Art Unit 1727